

## CLAIMS

What is claimed is:

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1. A method for the separation of a carbon nanotube-nucleic acid complex comprising:

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a) providing a carbon nanotube-nucleic acid complex in solution comprising an unfunctionalized carbon nanotube bound to a nucleic acid molecule wherein the solution comprises a densifying agent ;

b) loading the carbon nanotube-nucleic acid complex solution of step (a) on to an electrophoresis gel; and

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c) separating the loaded complexes of (b) by applying an electric field to the gel.

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2. A method according to Claim 1 wherein the electrophoresis gel is comprised of materials selected from the group consisting of agarose and acrylamide.

3. A method according to Claim 1 wherein the densifying agent is selected from the group consisting of glycerol, sucrose, and Ficoll

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4. A method for the separation of a carbon nanotube-nucleic acid complex comprising:

a) providing a carbon nanotube-nucleic acid complex in and aqueous solution comprising an unfunctionalized carbon nanotube bound to a nucleic acid molecule;

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b) adding a substantially water-miscible organic solvent to the dissolved complexes of (a) whereby a certain size fraction of the complexes are precipitated; and

c) collecting the complex precipitate of step (b).

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5. A method according to Claim 4 wherein the substantially water-miscible organic solvent is selected from the group consisting of methanol, ethanol, isopropanol, dimethyl sulfoxide, tetrahydrofuran, dimethylformamide, dioxane, and acetone.

6. A method for the separation of a carbon nanotube-nucleic acid complex comprising:

- 5 a) providing a carbon nanotube-nucleic acid complex in an aqueous solution comprising an unfunctionalized carbon nanotube bound to a nucleic acid molecule wherein the nucleic acid portion of said complex is comprised of at least 50% hydrophobic nucleotides;
- 10 b) applying the solution of (a) to an ion exchange media wherein the carbon nanotube-nucleic acid complex becomes associated with the ion exchange media; and
- c) eluting the carbon nanotube-nucleic acid complex from the ion exchange media into discrete fractions.

15 7. A method according to Claim 6 wherein the ion exchange media is selected from the group consisting of cholestyramine, diethylaminoethyl cellulose, diethylaminoethyl sephadex, diethylaminoethyl sepharose resins, cellulose phosphate, CM cellulose, CM sephadex and dowex resins.

20 8. A method according to Claim 6 wherein the nucleic acid portion of said complex is from about 5 to about 100 bases in length.

9. A method according to Claim 6 wherein the nucleic acid portion of said complex is at least 50% guanine.

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10. A method according to Claim 6 wherein the nucleic acid portion of said complex is defined by the general formula  $(G/T)_n$  wherein  $n=5-50$ .

30 11. A method according to any of Claims 1, 4 and 6 wherein the nucleic acid molecules are selected from the group consisting of; single stranded DNA, double stranded DNA, RNA and PNA.

12. A method according to either of Claims 1 and 4 wherein the nucleic acid is from about 10 bases to about 1000 bases in length.

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13. A method according to and of Claims 1, 4 and 6 wherein the nucleic acid molecule is selected from the group consisting of:

- a.  $A_n$  wherein  $n = 1 - 2000$ ;
- b.  $T_n$  wherein  $n = 1 - 2000$ ;
- c.  $C_n$  wherein  $n = 1 - 2000$ ;
- d.  $G_n$  wherein  $n = 1 - 2000$ ;
- 5 e.  $R_n$  wherein  $n = 1-2000$ , and wherein  $R$  may be either  $A$  or  $G$ ;
- f.  $Y_n$  wherein  $n = 1 - 2000$ , and wherein  $Y$  may be either  $C$  or  $T$ ;
- 10 g.  $M_n$  wherein  $n = 1 - 2000$ , and wherein  $M$  may be either  $A$  or  $C$ ;
- h.  $K_n$  wherein  $n = 1 - 2000$ , and wherein  $K$  may be either  $G$  or  $T$ ;
- i.  $S_n$  wherein  $n = 1 - 2000$ , and wherein  $S$  may be either  $C$  or  $G$ ;
- 15 j.  $W_n$  wherein  $n = 1 - 2000$ , and wherein  $W$  may be either  $A$  or  $T$ ;
- k.  $H_n$  wherein  $n = 1 - 2000$ , and wherein  $H$  may be either  $A$  or  $C$  or  $T$ ;
- 20 l.  $B_n$  wherein  $n = 1 - 2000$ , and wherein  $B$  may be either  $C$  or  $G$  or  $T$ ;
- m.  $V_n$  wherein  $n = 1 - 2000$ , and wherein  $V$  may be either  $A$  or  $C$  or  $G$ ;
- n.  $D_n$  wherein  $n = 1 - 2000$ , and wherein  $D$  may be either  $A$  or  $G$  or  $T$ ; and
- 25 o.  $N_n$  wherein  $n = 1 - 2000$ , and wherein  $N$  may be either  $A$  or  $C$  or  $T$  or  $G$ .

14. A population of carbon nanotubes separated by the method of any one of Claims 1, 4 and 6.

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15. The population of carbon nanotubes according to Claim 14 having a uniform diameter.

16. The population of carbon nanotubes according to Claim 14 having a uniform chirality.

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17. The population of carbon nanotubes according to Claim 14 wherein the carbon nanotubes are uniformly metallic.

5 18. The population of carbon nanotubes according to Claim 14 wherein the carbon nanotubes are uniformly semiconducting.

19. The population of nanotubes according to Claim 14 wherein the nanotubes are metallized.